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| EXAMINER | | | | |
| CROUSE, BRETT ALAN | | | | |
| ART UNIT | | PAPER NUMBER | | |
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/529,238

Applicant(s)

ARAKANE ET AL.

Examiner

Brett A. Crouse

Art Unit

1794

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 March 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SF/ICE)
Paper No(s)/Mail Date 20050325/20071205
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Specification

1. The disclosure is objected to for the following reasons:

The comparative examples (1-3) set forth in the specification and summarized in Table 1, page 88, of the specification present material combinations and properties which meet the limitations of claims 1 and 2. As such, the specification does not clearly define what applicant intends to distinguish from the prior art as drawn to the instant invention. Appropriate correction is required.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(c) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1, 2, 4, 6-10 and 14 are rejected under 35 U.S.C. 102(b) as being anticipated by Okada et al., US 2002/055014, as evidenced by Matsushima et al., Current Applied Physics, (2005), Volume 5, Pages 305-308.
Okada teaches:

As to claims 1, 2, 8-10 and 14:

Paragraphs [0236]-[0238], example 1, table 1, teaches electroluminescent devices comprising a light emitting layer having the compositions shown in table 1 and an Alq₃ electron transport layer deposited thereupon. Compositions of the light emitting layer include CBP, devices 101 and 102, as host and a phosphorescent light emitting material, K-1 and K-6, the structures of which are shown in paragraph [0214]. The properties of CBP and Alq are taught in Table 1, page 88, of the instant specification.

As to claim 4:

Paragraphs [0217] and [0227]-[0229], teach a hole transport layer.

As to claims 6 and 7:

CBP is held to inherently possess an electron mobility of greater than 10^{-6} cm²/Vs as evidenced by Matsushima, page 307, column 2, paragraph 1, and figure 6, which teaches a CBP electron mobility of 10^{-4} cm²/Vs.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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5. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fujino et al., JP 2000-169448, in view of Okada et al., US 2002/055014, as evidenced by Tanaka et al., Japan Journal of Applied Physics, (2003), Volume 42, Pages 2737-2740.

Fujino teaches:

Abstract and paragraph [0001], teach compounds of formula (I) as charge transfer or light emitting materials. The passage additionally teaches the compounds of formula (I) are useful in electroluminescent devices.

Paragraphs [0032], [0033], [0038], [0039], [0040], compounds (5), (10), (11), (39), (45), (51), teach compounds of formula (I) comprising one or more carbazole groups linked to a pyridine ring via an arylene group. In the absence of unexpected results the compounds are expected to possess properties meeting the host material limitations due to their close similarity in structure to exemplified structure PB-102 of the instant invention.

Paragraphs [0082]-[0083], teach a luminescent dopant added to the light emitting layer.

Paragraphs [0069]-[0072], drawings 1-4, teach electroluminescent device structures.

Paragraph [0118], teaches OXD-7 as the electron transport material in an electroluminescent device example.

Tanaka as evidence:

Page 2739, column 1, lines 27-29, teach the triplet energy of OXD-7 is 2.7 eV.

Fujino does not teach:

Fujino does not teach the use of a phosphorescent dopant in the light emitting layer.

Okada teaches:

Paragraph [0004], teaches phosphorescent dopants, such as Ir(ppy)₃, provide improved quantum efficiency.

Paragraphs [0206]-[0214], teach preferred phosphorescent compounds. Paragraph [0213], teaches Ir(ppy)₃, K-1 and complexes having the partial structure thereof are preferred.

It would have been obvious to one of ordinary skill in the art to use a phosphorescent dopant of Okada, such as preferred compound Ir(ppy)₃, in the device of Fujino in order to achieve improved quantum efficiency in the device of Fujino.

6. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Okada et al., US 2002/055014, as evidenced by Matsushima et al., Current Applied Physics, (2005), Volume 5, Pages 305-308, as applied to claims 1, 2, 4, 6-10 and 14 above, and further in view of Hung et al., US 6,137,223.

The teachings of Okada as in the rejection above are relied upon.

Okada does not teach:

Okada does not teach the use of a reductive dopant.

Hung teaches:

Abstract, teaches an electroluminescent device structure including a dopant layer to improve electron injection.

Column 15, line 1 through column 16, line 17, teach a lithium doped layer between the cathode buffer layer and electron transport layer. The electron injection properties of the device are improved. The device is compared with a similar device lacking the lithium dopant.

It would have been obvious to one of ordinary skill in the art to incorporate the lithium dopant of Hung into the device of Okada in order to realize the improved performance as taught by Hung.

7. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Okada et al., US 2002/055014, as evidenced by Matsushima et al., Current Applied Physics, (2005), Volume 5, Pages 305-308, as applied to claims 1, 2, 4, 6-10 and 14 above, and further in view of Adachi et al., Organic Electronics, (2001), Volume 2, Pages 37-43.

The teachings of Okada as in the rejection above are relied upon.

Okada does not teach:

Okada does not teach a relationship between the triplet energy level of the hole transport layer material and the triplet energy levels of the phosphorescent dopant of the light emitting layer.

Adachi teaches:

Pages 40-41, teach energy is transferred from the MTDATA hole transport layer material into the Ir(ppy)₃ dopant in the adjacent light emitting layer. The triplet energy of

MTDATA is greater than the triplet energy of Ir(ppy)₃ resulting in improved device performance by improved triplet exciton confinement.

It would have been obvious to one of ordinary skill in the art to select a hole transport material having a triplet energy greater than that of the phosphorescent dopant in the adjacent light emitting layer of the device of Okada to improve device performance by improving exciton confinement as suggested by Adachi.

8. Claims 11-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okada et al., US 2002/055014, as evidenced by Matsushima et al., Current Applied Physics, (2005), Volume 5, Pages 305-308, as applied to claims 1, 2, 4, 6-10 and 14 above, and further in view of Okada 6,656,612.

The teachings of Okada '014 as in the rejection above are relied upon.

Okada '014 does not teach:

Okada '014 does not provide an example of an electron transport layer in which an exemplified compound of formula 1 is used. Okada '014 does teach various heterocyclic derivatives are useful as electron transport materials.

Okada '612 teaches:

Column 2, line 34 through column 6, line 4, formulae (I – XI), teach nitrogen containing heterocyclic compounds useful in electroluminescent devices.

Column 6, lines 33-51, provide examples of condensed rings of the various formulae.

Columns 8 through 12, teach various linking groups including naphthalene and anthracene as required by claim 12.

Column 93, lines 45-63, examples 5 and 6, teach exemplified compounds 21 and 18 in the electron transport layer. The compounds meet the limitations of claims 11 and 13.

It would have been obvious to one of ordinary skill in the art to use the compounds of Okada '612 in the electron transport layer of the device of Okada '014 with the expectation that the resulting layer of the device of Okada '612 would exhibit suitable properties and efficient device operation as observed in Okada '612.

9. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Okada et al., US 2002/055014, as evidenced by Matsushima et al., Current Applied Physics, (2005), Volume 5, Pages 305-308, as applied to claims 1, 2, 4, 6-10 and 14 above.

The teachings of Okada as in the rejection above are relied upon.

Okada does not provide an experimental example of a carbazole compound bonded to a nitrogen containing non-carbazole ring used in an electroluminescent device. However, Okada teaches such compounds with the scope of formula (I) and provides examples of such compounds taught as useful in electroluminescent devices as exemplified compounds (13, 23, 33, 43, 53, 63, 73, 83, 93, 103, 113).

It would have been obvious to one of ordinary skill in the art to use the exemplified compounds of Okada in combination with the phosphorescent materials of Okada with an expectation of obtaining the device performance as desired by Okada.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brett A. Crouse whose telephone number is (571)-272-6494. The examiner can normally be reached on Monday - Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Milton I. Cano can be reached on 571-272-1398. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/B. A. C./
Examiner, Art Unit 1794

/Dawn Garrett/
Primary Examiner, Art Unit 1794